Remarks

Applicant has cancelled claims 1-40 and has added new claims 41-84. Applicant respectfully submits that no new matter was added by the amendment, as all of the amended matter was either previously illustrated or described in the drawings, written specification and/or claims of the present application. (see p. 15, lines 4-22; and FIGS. 10-12). Entry of the amendment and favorable consideration thereof is earnestly requested.

The Examiner has rejected claims 1-16, 19-34 and 37-40 under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,995,534 to Fullerton ("the '534 patent") in view of U.S. Patent No. 6,234,587 to Dent ("the '587 patent"). The Examiner has further rejected claims 17, 18, 35 and 36 under 35 U.S.C. §103(a) as being unpatentable over the '534 patent in view of the '534 patent, and further in view of U.S. Patent No. 6,240,126 to Ohashi ("the '126 patent"). These rejections are respectfully traversed.

All of the claims of the present application require among other elements that spectral lines of the output signal are broadened to fill gaps between individual spectral lines and a spectral power density of the output signal is reduced without a bandwidth of the output signal being substantially increased.

As stated in the specification of the present application unrestricted bandwidths are expensive and that a good design of a data circuit does not employ more bandwidth than is necessary for a transmission of information. For an optimization of a data link, the coding and that shaping of a signal should be made in such a way that additional bandwidth is not necessary.

As described in the specification of the present invention the transmitter generates a signal having substantially a line spectrum. The signal is modulated so that a

broadening of the individual lines or peaks is achieved so that frequency gaps between the lines are filled. (p. 15, lines 4-22). The energy of the signal is represented by the area enclosed by a narrow line or peak. (FIG. 10). As the total energy of the signal remains constant during modulation, the result is a large reduction of the amplitude of the lines or peaks and a reduction of the signal power density. This in turn results in a large reduction of unwanted emission of electromagnetic energy. Examples are shown in the specification, for instance, two spectral traces shown in FIG. 8 illustrate a typical broadening of a spectral line or peak. As described for example in the specification, FIG. 22 shows a line spectrum of a signal before modulation. FIG. 23 shows the effect of a short-length coding. Frequency modulation of the signal leads to the spectrum shown in FIG. 24. Coding with a long pseudo noise string leads to the spectrum of FIG. 25. Therefore, in accordance with the invention, the bandwidth of the signal is not increased.

With reference to the '534 patent, applicant notes that the "impulse radio communication system is an ultrawide-band time domain system" for propagation of ultra wide-band signals. (abstract). For instance, FIGS. 2A and 2B illustrate a 1 mpps system with unmodulated 1 ns pulses in the time and frequency domains (202 & 204 respectively). In the frequency domain this pulse produces energy spikes (204) at one megahertz intervals. Impulse radio techniques are used to achieve smoothing by applying to each pulse a PN code dither. FIG. 4 illustrates the impact of pseudo-random dither on energy distribution in the frequency domain and shows the impact of using a 256 position PN code relative to an uncoded signal. The result however is generation of a large number of coded signal energy spikes extending along a vastly expanded bandwidth.

Column 11, lines 1-24 describe examples of the processing gain achieved by impulse radio, the processing gain being generally the ratio of the bandwidth of the received signal to the bandwidth of the received information signal. For instance, a direct sequence spread spectrum system with a 10 kHz information bandwidth and a 16 MHz

channel bandwidth provides a processing gain of 1600 or 32 db. However, far greater processing gains are achieved with impulse radio systems where for the same 10 kHz information bandwidth and a 2 GHz channel bandwidth, the processing gain is 200,000 or 53 db. In stressing the value of achieving maximum processing gain, the '534 patent directly teaches away from the present claimed invention where "a spectral power density of the output signal is reduced without a bandwidth of the output signal being substantially increased."

Therefore, applicant respectfully submits that because neither the '534 patent, the '587 patent, nor the '126 patent teach, disclose, or suggest that spectral lines of the output signal are broadened to fill gaps between individual spectral lines and a spectral power density of the output signal is reduced without a bandwidth of the output signal being substantially increased as required by all of the claims of the present invention, that no combination of the above-listed references can render the claims obvious.

It is respectfully submitted that claims 41-84, all of the claims remaining in the application, are in order for allowance and early notice to that effect is respectfully requested.

Respectfully submitted,

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